

AN ACCOUNT OF THE OCCURRENCE OF *CHRYSOMPHALUS AURANTII*, MASK AND *LACCIFER LACCA*, KERR ON GRAPE FRUIT IN RANCHI DISTRICT, CHOTA NAGPUR, WITH A NOTE ON THE *CHALCIDOID* PARASITES OF *ASPIDIOTUS ORIENTALIS*, NEWST.

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(With a plate).

Chrysomphalus aurantii, the Californian Red Scale, although a serious pest of *Citrus* in many parts of the world, particularly in California and Egypt, does not occur as a pest of any great importance in India. It has been recorded in this country on the following, but in no case as a serious pest. *Agave americana*, *Citrus decumana* (pomelo), and *C. aurantium* (orange), *Cycas cincinalis* and *C. recurvata*, *Jasminum*, *Morinda tinctoria*, *Morus sp.* (mulberry), *Psidium guajava* (guava) and on Rose.

In this district *C. decumana* fruits are commonly found lightly attacked by the scale, and garden rose is occasionally severely attacked. A number of *C. decumana* trees introduced at Namkum in 1927-28 were found to be slightly affected by this *Coccid* in February 1933.

Mr. H. T. Bates, then Manager of the Sabaya Division of the Assam Frontier Tea Company, introduced in June 1930 a small number of one year old grafts of the Grape Fruit *Citrus decumana* var. *grandis* at Sabaya. These plants established themselves satisfactorily, but in March 1931 were found to be attacked by *C. aurantii*, the attack was not very heavy but was of sufficient intensity to warrant control measures, a reinfection was observed in January 1933 and control measures were repeated.

At this time, one of the plants was observed to be lightly infected with lac (*Laccifer lacca*, Kerr), the infection having originated apparently from a *Zizyphus Jujuba* (Ber) tree close by, which had been purposely infected for the Baisakhi crop. This is an example of lac as a pest, and the infected plant was treated in the same way as those affected by *C. aurantii*.

Of the sprays utilised Lime Sulphur was found to be effective against both *Coccids* but is not to be recommended as it scorches the foliage severely. A resin spray made up as follows was found to be fairly satisfactory. It is similar to that used by Barritt (1929) against *Chrysomphalus aonidum* in Egypt.

Resin	...	...	...	...	1 lb.
Crude Castor Oil	...	...	...	...	3 lbs.
Ammonia	...	...	...	...	1½ lbs.
					(sp. gr. 0.888)
Water	...	...	...	...	180 lbs.
					(18 gals.)

The resin and castor oil were heated together till the former dissolved, the solution was allowed to cool and was stirred into the water to which the ammonia had previously been added. The resultant solution is a white coloured sticky emulsion, which is ready for use. It may be kept in sealed drums.

The most effective spray tested was a Kerosene soap emulsion made up as follows:—

Stock.

Kerosene Oil	...	...	...	2 gals.
Karunj Soap	...	...	...	½ lb.
Water (soft)	...	...	...	1 gal.

The soap was dissolved in water heated to boiling, the kerosene was added to the mixture while still boiling hot and stirred until a thick creamy fluid

resulted. The success of the spray depends to a considerable extent on the efficiency of the stirring. The solution may be kept in sealed drums. This stock if properly made should adhere to glass without separating into oily particles, and when spread with the ball of the finger should form a fine continuous film. It will keep for a considerable time. If insufficiently stirred the oil will separate and collect at the top.

For use the stock was diluted with water, 1 part stock to 3 parts water, and at this concentration did not scorch the foliage. Tests should however be made with various dilutions as the susceptibility of foliage to scorch varies very considerably. Spraying preferably should be done in the evening or on cloudy days, not in the full heat of the sun as this tends to cause scorch.

The female scale can be identified by the following characters:—

Scale approximately circular, average diameter about 1.5 mm., median area slightly convex, marginal area broad and flat. The scale is semi-transparent, and shows the outline of the insect below, the colour is grey, but actually appears orange yellow except marginally due to the colour of the insect lying below. The exuviae are central or nearly so, bright orange red or orange yellow in colour and are somewhat obscured by secretion. The first exuvia bears a small central boss which may bear a small nipple of white wax, the cicatrix. The exuviae are highly polished beneath. The whole dorsal surface except marginally in the living insect appears therefore orange red or orange yellow in colour.

The ventral scale is well developed, thin at the centre, stout towards the margins firmly attached to the dorsal scale, and to the body of the female as is also the dorsal scale, making the extraction of the insect difficult except by dissolving away the scales in Potassium hydroxide.

The morphology of the female has already been fully described by a number of writers including Green (1896), Newstead (1900), Herrick (1911) and Quayle (1911). The most conspicuous features are that in the living insect the rostrum is usually pushed a little to one side, and that at the period of gestation the pygidium is partly contracted within the body and is overlapped and sometimes almost enclosed by the sides of the thorax.

The pygidium of the specimens examined showed certain small differences from the normal, which are probably local variations. (see Plate)

The second lobe is frequently rounded internally and notched externally, but may be notched on both surfaces, the third lobe is almost invariably notched externally and rounded internally.

The pectinae are arranged 2-2-2-3, those in the median and second incisurae distapectinae, those in the third incisura and on the lateris unapectinae. The first pectina in the third incisura and the three pectinae on the lateris have two equal branches, between which in the case of those on the lateris a finger-like projection occurs. The unapectinae are fringed on their external margin only and in the case of the bilobed pectinae the fringing on the internal lobe is greatly reduced.

There is a pair of paraphyses to each lobe, the external paraphyse of the second lobe is much reduced and may be absent. In all specimens from this locality a distinct club-shaped thickening of the cuticle of the dorsal surface arises from the base of the third incisura (see Plate, par A), whose structure exactly that of a paraphyse, but whose disposition is abnormal. It forms the internal border of the paraphysial furrow occurring in the third incisura which would normally be formed by the external paraphyse of the second lobe.

A seta occurs external to the latadent on the ventral surface in all local specimens corresponding with the setae occurring external to each of the second and third lobes on the ventral surface.

The four calles of typical specimens occur as transverse bands of thickenings in the cephalic region of the dorsal aspect of the pygidium; in local specimens, the lateral calle is the longer and more prominent, the median is shorter and is in many specimens broken into two separate unequal parts which are adjacent, and which are occasionally connected by a narrow neck.

In view of the absence of genacerores and densariae and the presence of paraphyses, it seems probable that this species is referable to Leonardi's Genus *Aonidiella*, a course which has been followed by certain Authors.

A single adult of the *Aphelinid*, *Aphytis chrysomphali*, Mercet was taken resting on a twig infected with *C. aurantii*. This species has been reared in small numbers at Nankum from *Aspidiotus orientalis* on *Zizyphus Jujuba* (Ber).

I should like to thank Sir Guy A. K. Marshall, F.R.S. and Dr. Ferrière for the identification of this and the following species.

A. chrysomphali is reported by Quayle (1932) as one of the commonest parasites of the Red Scale in California, he also records it from the Yellow Scale *Aonidiella (Chrysomphalus) citrina* Coq.

Comperiella bifasciata, How. (*Encyrtidae*) is a common parasite of *A. orientalis* in this district. Quayle (1932) records this species from the Yellow but not from the Red Scale in California.

Other *Chalcidoidea* bred from *A. orientalis* at Naukum were, *Physcus* sp. (near *flaviventris* How.) which was rather rare; *Tetrastichus purpureus* Cam (*Eulophidae*) as a primary and probably also as a secondary parasite (Glover, 1933), and *Maricetta javensis* How. (*Aphelinidae*) as a hyperparasite of primary *Chalcidoid* parasites of this *Coccid* (Glover, 1933, reported as *Perrisopterus* sp.).

In conclusion I wish to express my thanks to Mrs. Dorothy Norris, Director of this Institute, and to Dr. C. F. C. Beeson, Forest Entomologist, Forest Research Institute, Dehra Dun, for advice and criticism, to Mr. H. T. Bates for permission to experiment on his trees and to Mr. E. Heber for preparing the plate.

Since this paper was submitted for publication on July 7th 1934, a paper on the Genus *Comperiella*, Howard by Dr. T. V. Ramakrishna Ayyar has appeared in *Records of the Indian Museum*, vol. xxxvi, pt. II, June 1934. In this paper Ayyar records the Genus *Comperiella* from India for the first time, and describes a new species *C. indica* sp. nov., which he originally recorded as *Comperiella* sp. parasitic on the tamarind scale *Aspidiotus tamarindii* G. at Coimbatore where it occurs on tamarind often associated with *Aspidiotus orientalis*. N. (Imp. Inst. Agric. Res., Pusa Bull. 197, 1934).

Comperiella bifasciata is therefore recorded from India for the first time, and is the second species of this Genus known to occur in this country. *C. bifasciata* and *C. indica* are very similar, particularly as regards colouration, but may be separated by the fact that in the former the fore wing of the female has two divergent brownish fasciae, and that in the latter the fore wing of the female has one brownish fascia only.

Aphytis chrysomphali is believed to be recorded from India for the first time.

EXPLANATION OF PLATE.

Dorsal view of the pygidial margin and fringe of *Chrysomphalus aurantii*. an., anus; dp., distapectinae; ld., latadent; lm., median lobe; l. 2nd, 2nd lobe; l. 3rd, 3rd lobe; or., oraceratubae; par., paraphyses; par. A., extra abnormally disposed paraphyse; s., setae; up., unapectinae.

BIBLIOGRAPHY.

1896. Green (E. E.), *The Coccidae of Ceylon*, Pt. 1, Dulau & Co., London, 1896.
1900. Newstead (R.), *Monograph of the Coccidae of the British Isles*, vol. i, Rav. Soc. London, 1900.
1911. Herrick (G. H.), *Some Scale Insects of Mississippi with Notes on Certain Species from Texas*. Tech. Bull., 2 Mississippi Agric. Expt. Station Agric. College, Mississippi, 1911.
1911. Quayle (H. J.), *The Red Orange Scale*, Bull. 222, University California Coll. Agric., Agric. Exp. Station, Berkeley, California, July 1911.
1917. Lawson (P. B.), *Scale Insects injurious to Fruit and Shade Trees*. Bull. University Kansas Biol. Series, vol. xviii, No. 1, 1917.
1929. Barritt (N. W.), *A New Spray for Scale Insects on Citrus in Egypt*. Bull. Ent. Res., xx, 1929.
1932. Quayle (H. J.), *Biology and Control of Citrus Insects and mites*, Bull. 542, University California, Coll. Agric., Agric. Exp. Station, Berkeley, California, November 1932.
1933. Glover (P. M.), *Aspidiotus (Furcaspis) orientalis* Newstead (*Coccidae*), its Economic Importance in Lac Cultivation and its Control, Bull. 16, Ind. Lac. Res. Inst., Calcutta, 1933.